

What is claimed:

1           1. A vector comprising from 5' to 3':  
2           a) a packaging sequence;  
3           b) a heterologous insert sequence or restriction sites for insertion of a heterologous  
4 sequence; and  
5           c) a 3' long terminal repeat (LTR) sequence,  
6           wherein at least two codons of the packaging sequence are altered so as to reduce  
7 formation of fusion polypeptides encoded by the packaging sequence or a portion thereof,  
8 and the heterologous insert sequence.

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10          2. The vector of claim 1, wherein at least two ATG codons of the packaging  
11 sequence have been altered.

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13          3. The vector of claim 2, wherein the ATG initiation codon of the packaging  
14 sequence and at least one internal ATG codon of the packaging sequence have been altered.

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16          4. The vector of claim 1, wherein the packaging sequence is a *gag* sequence.

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18          5. The vector of claim 4, wherein the *gag* sequence is an amino-terminal portion  
19 of the *gag* gene.

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21          6. The vector of claim 4, wherein the *gag* sequence comprises the nucleotide  
22 sequence of SEQ ID NO:2, or a portion thereof.

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24          7. The vector of claim 3, wherein at least two internal ATG codons of the  
25 packaging sequence have been altered.

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27          8. The vector of claim 3, wherein the internal codon which is altered is the codon  
28 at residues 1097-1099 of SEQ ID NO:1.

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30           9.       The vector of claim 3, wherein the internal codon which is altered is the codon  
31       at residues 1589-1591 of SEQ ID NO:1.

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33           10.      The vector of claim 3, wherein the internal codon at residues 1097-1099 and  
34       the internal codon at residues 1589-1591 of SEQ ID NO:1 have been altered.

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36           11.      The vector of claim 2, wherein one, two or all of the nucleotides of the ATG  
37       codon(s) have been altered.

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39           12.      The vector of claim 1, wherein the vector includes a heterologous insert  
40       sequence.

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42           13.      A vector comprising from 5' to 3':

43           a) a packaging sequence, wherein at least one ATG codon of the packaging sequence  
44       has been altered;

45           b) a heterologous insert sequence or restriction sites for insertion of a heterologous  
46       sequence; and

47           c) a 3' LTR sequence, wherein the 3' LTR comprises a proviral recovery sequence.

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49           14.      The vector of claim 13, wherein at least two ATG codons of the packaging  
50       sequence have been altered.

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52           15.      The vector of claim 14, wherein the ATG initiation codon of the packaging  
53       sequence and at least one internal ATG codon of the packaging sequence have been altered.

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55           16.      The vector of claim 13, wherein the packaging sequence is a *gag* sequence.

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57           17.      The vector of claim 16, wherein the *gag* sequence is an amino-terminal  
58       portion of the *gag* gene.

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60        18. The vector of claim 14, wherein at least two internal ATG codons of the  
61 packaging sequence have been altered.

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63        19. The vector of claim 14, wherein the internal codon which is altered is the  
64 codon at residues 1097-1099 of SEQ ID NO:1.

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66        20. The vector of claim 14, wherein the internal codon which is altered is the  
67 codon at residues 1589-1591 of SEQ ID NO:1.

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69        21. The vector of claim 14, wherein the internal codon at residues 1097-1099 and  
70 the internal codon at residues 1589-1591 of SEQ ID NO:1 have been altered.

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72        22. The vector of claim 14, wherein all of the nucleotides of the ATG codon(s)  
73 have been altered.

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75        23. The vector of claim 13, wherein the vector includes a heterologous insert  
76 sequence.

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78        24. The viral vector of claim 13, further comprising a bacterial origin of  
79 replication.

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81        25. The viral vector of claim 24, wherein at least a portion of the bacterial origin  
82 of replication has been removed.

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84        26. The viral vector of claim 13, wherein the bacterial marker sequence is a  
85 bleomycin marker sequence.

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87        27. The viral vector of claim 13, wherein the proviral recovery sequence is  
88 located within a portion of the 3' LTR which duplicates upon integration.

89  
90        28. A vector comprising from 5' to 3':

91           a) a packaging sequence, wherein at least one ATG codon of the packaging sequence  
92 has been altered;  
93           b) a heterologous insert sequence or restriction sites for insertion of a heterologous  
94 sequence;  
95           c) a bacterial marker sequence, wherein the bacterial marker is less than 600 basepairs  
96 in length; and  
97           d) a 3' LTR sequence, wherein the 3' LTR comprises a proviral recovery sequence.

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99       29. A viral vector comprising:  
100           a) a packaging sequence;  
101           b) a heterologous insert sequence;  
102           c) a bacterial marker sequence, wherein the bacterial marker sequence is less  
103 than 600 basepairs in length;  
104           d) a 3' LTR comprising a proviral recovery sequence,  
105           wherein the vector comprises and can express a heterologous insert sequence  
106 greater than about 8 kilobases in length.

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108       30. The viral vector of claim 29, wherein the packaging sequence is altered at an  
109 initiation codon of the packaging sequence and at least one potential initiation codon of the  
110 packaging sequence.

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112       31. The viral vector of claim 29, further comprising a bacterial origin of  
113 replication.

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115       32. The viral vector of claim 31, wherein at least a portion of the bacterial origin  
116 of replication has been removed.

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118       33. The viral vector of claim 29, wherein the bacterial marker sequence is a  
119 bleomycin marker sequence.